(3 marks) a one-paragraph summary of the class project;

(3 marks) surveys of the problems and methods;

(4 marks) a big picture on the organization of your code;

(10 marks) final versions of your code in the Appendix;

(4 marks) report your final results;

(3 marks) discuss the physics of these results; and

(3 marks) list your references.

**Aim**

Investigate chaos in Lorenz equation using computational physics in python by running Runge-Kutta method.

**Summary**

The Lorenz Equations (above) provide a simple and yet significant area of study as it provides scientists a chaotic dynamical outlook of a system. We will be investigating different parameters of the Lorenz Equation to produce some of the most fascinating graphical outcomes of the trajectory of this 3 dimensional ODE. We will be applying what we learned in class using Runge-Kutta method and many more.

This report will revolve around the book created by Steven H. Strogatz titled “Nonlinear Dynamics and chaos” with the help of computational knowledge and simulations in Python.

**Introduction**

First derived by Edward Lorenz in 1963, the three-dimensional system came from a simplified model of convection system of the atmosphere. The trajectories of the system also converge into stable cycles which are now called strange attractors relating to fractals; understanding these natural phenomenon can unlock some of the mysteries the universe has to offer.

Popularized by media, even non mathematical or physics people are enchanted by the beauty of the chaos in the Lorenz equation. These fascination might attribute to the appeal of the patterns they produce and hence inspiring people with creative ideas and philosophy. In this report, we will be investigating what causes these patterns by exploring multiple parameters of the Lorenz Equations and tuning gathering data for each change in the system. Furthermore, we will look into how these patterns are produced and what they mean.

**Survey**

**Code explanation**

**Results**

**Discussion**

**References**

**Appendix**